

MEMORANDUM FOR: JH
John: F.Y.I.

With regard to the classification of the [] Report, I find that the TSSG people who were responsible for the classification are "legal" in the sense that they had checked this out with our TCO [] who, in turn, received guidance from the DDI/TCO []. Attached is a cable which was sent to [] giving them instructions on how to word the document to keep it out of the codeword control system.

Our R&D'ers traditionally seek the lowest possible classification on their documentation since codeword controls spells difficulty,

(over)

(DATE)

DECLASS REVIEW by NGA/DOD

Approved For Release 2004/02/11 : CIA-RDP78B05703A0001000700

particularly when they are working away from the confines and protections of Sometimes they play it very close to the line (as I think they did in this case). In the final analysis, I suppose it's how you feel about such matters - administrative expediency or protection of security information - you pays your money and you takes your choice.

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29 Jan 70

Approved For Release 2004/02/11 : CIA-RDP78B05703A0001000700

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27 Jan 70

AL -

- This is a useful summary.
Keep it handy for reference.

- I am fascinated by
the "SECRET" classification.
How come?

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FROM TSSG/RED			DATE 21 JAN 1970
TO	INITIALS	DATE	REMARKS
DIRECTOR			1-2 <u>FYI</u>
DEP/DIRECTOR			
EXEC/DIRECTOR	<i>[Signature]</i>	1/26	
SPECIAL ASST	1	1/26	
ASST TO DIR	3		
ASST TO DEP/DIR			
CH/PPBS			
DEP CH/PPBS			
EO/PPBS			
CH/IEG			
DEP CH/IEG			
EO/IEG			
CH/PSG			
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EO/PSG			
CH/TSSG			
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EO/TSSG			
CH/SSD/TSSG			
PERSONNEL			
LOGISTICS			
TRAINING			
RECORDS MGT			
SECURITY			
FINANCE			
DIR/IAS/DDI			
CH/DIAXX-4			
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NPIC/TSSG/RED-030-70

21 January 1970

MEMORANDUM FOR: Executive Director, National Photographic Interpretation Center
Chief, Planning, Programming & Budgeting Staff, NPIC
Chief, Technical Services & Support Group, NPIC
Chief, Imagery Exploitation Group, NPIC
Chief, Production Services Group, NPIC

SUBJECT : Implementation Plan for Mid-1970's Photointerpretation Workstation Concepts

REFERENCE : Executive Director Memorandum, NPIC/D-04/70 re subject dated 8 January 1970

1. Copies of the information supplement to the [] Report referred to in Paragraph 4 of the reference have been received in TSSG/RED.

2. They are being distributed to the addressees herewith in the same number of copies as the original [] Report. If additional copies are required, please contact []

Special Assistant for Plans & Applications, RED/TSSG

Attachment:

[] Report DK-501

Distribution:

- Original - NPIC/ExecDir w/att
- 1 - NPIC/ODir w/2atts
- 1 - NPIC/PPBS w/att
- 1 - NPIC/TSSG w/att
- 1 - NPIC/IEG w/att
- 1 - NPIC/PSG w/att
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GROUP 1

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SUMMARY OF

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"MID-1970'S PHOTOINTERPRETATION WORKSTATION CONCEPTS"

DK-501

12 January 1970

ISSUE 2

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1.0 INTRODUCTION

This summary is intended as a supplement to the subject report. Material presented here should not be used without a review of that report.

The objective of this study is to develop and evaluate concepts for an interpretation workstation to be implemented at the National Photointerpretation Center (NPIC) in the mid-1970's. This workstation consists of all equipment, personnel, and procedures directly involved in the interpretation of mission imagery. It is composed of a number of subworkstations or units (i.e., individual interpreters and associated equipment). For the time period of concern this imagery is expected to come from [REDACTED]

[REDACTED] Current requirements for the interpretation of this imagery as defined by the National Tasking Plan are assumed to continue through the mid-1970's.

The most significant impact on the workstation of the changes in acquisition systems is the amount of imagery to be interpreted. An increase of slightly over 100% is identified. The problem is complicated by expected improvements in resolution, increased obliquity, increased use of color imagery, and increased availability of collateral material.

2.0 APPROACH

Four basic approaches were identified as possible solutions to the problems created by these expected changes.

- o Specialization of search equipment and activities.
- o Mechanization of ancillary interpretation functions.
- o Use of a standardized chip system.
- o Provision of an interpreter mensuration capability.

Equipment components considered technically feasible of implementing these approaches in the time period under consideration were selected. Performance requirements for these components, based on expected changes in imagery characteristics, were established. Various combinations of approaches and components were assembled into a number of preliminary alternate workstation

concepts. Based on an evaluation of the concepts, Sponsor personnel selected the three which appeared to be the most promising for final definition and evaluation.

3.0 CONCEPT DESCRIPTIONS

The three selected concepts involved different combinations of search specialization and mechanization of ancillary functions. The use of chips and photointerpreter mensuration were treated as options for all three concepts. Each workstation concept is made up of a number of units. A workstation unit is defined as the equipment used by an individual interpreter in performing his assigned activities. Several different classes of units, related to different interpretation operations, are defined for each of the concepts. These operations are related to the current phase designations used at NPIC as shown in Table 1.

TABLE 1: OPERATIONAL PHASES

CURRENT NPIC DESIGNATION	OPERATION
PHASE I	OAK Readout
PHASE II	OAK Supplement Readout NPIC Readout General Area Search <ul style="list-style-type: none">◦ Initial Scan◦ Detailed examination of potential targets
PHASE III	Detailed Analysis

After final definition, the three concepts were evaluated to establish numbers of units, equipment items, and personnel required to meet the workload predicted for the mid-1970's. The three concepts and resulting evaluations are summarized below. It is important to note that these results, particularly absolute values reported in the evaluations, are dependent on the validity of a number of assumptions made during the course of the analysis. Use of specific data presented here should not be made without a critical review of the assumptions presented in the subject report.

3.1 Concept #1 - Search Specialization with Rear Projection Viewer

This concept is intended to provide for the introduction of search specialization with minimum modification to other aspects of the workstation. Two classes of units are provided, one for target readout and analysis, the other for general area search. A third class is added with the interpreter measurement option. These classes and related equipment are described in Table 2.

The readout and analysis units are intended to represent the planned operational development of the basic capabilities now provided at NPIC. Improvements are expected to accommodate changes in imagery characteristics with new acquisition systems and to provide better interpreter access to the target data file.

The general area search units include the same equipment as the units above with the addition of a rear projection viewer. This viewer is intended to provide for more efficient and effective scan of large areas of imagery as required in the general area search operation. This should lead to increased scan rate and greater completeness with respect to the number of new targets found. Increased viewing comfort during prolonged, continuous viewing is the primary advantage of the projection technique. Further developments to improve display quality, however, are needed for effective use. Such improvements will not achieve the quality levels needed for fine detail examination and therefore projection viewers will be limited to use for initial

TABLE 2: CONCEPT #1 WORKSTATION UNITS

CLASS OF UNIT	GENERAL MISSION	NUMBER OF * UNITS REQ'D	EQUIPMENT		PERSONNEL REQUIRED*
			TYPE	NUMBER	
Readout and Analysis	Perform all readout operations (Phase I & II) involving known targets (OAK, OAK Supplement and NPIC) and all detailed analysis (Phase III) activities except mensuration.	180	<ul style="list-style-type: none"> Light Table w/Supplementary Optics Integrated Information System Display (IIS) 	180 18	180
General Area Search	Perform all general area search operations, i.e., scan all input ground coverage for the presence of new targets. Examine new targets found and report significant information (Phase II).	36	<ul style="list-style-type: none"> Rear Projection Viewer Light Table w/Supplementary Optics Integrated Information System Display 	36 36 4	36
Mensuration	Perform measurements required for target identification and/or simple dimensions associated with immediate readout activities (Phase I & II)	6	<ul style="list-style-type: none"> Digitized Light Table Computer Interface 	6 6	0
TOTAL					216

* Values shown are based on a workload analysis of the expected load from all three systems and assume that a standardized chip system does not exist. See Table 1-1 of the subject report for acquisition system designations. Values include a 19% allowance for leave and training.

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scan only. Direct optical viewing (a light table and microstereoscope in this case) must be provided for subsequent examination of potential targets found in the initial scan.

The mensuration units include the digitized light table to provide a measuring capability with adequate accuracy for the mensuration tasks that might be performed by the interpreter. Computer interface equipment is needed to provide the necessary on-line computer capability. These mensuration units will not be capable of performing the complex, high precision tasks normally associated with Phase III work. Computational capabilities will be limited in scope and accuracy by programs available within the on-line computer system. There are no personnel requirements associated with these units. They are intended for use by individual interpreters as needed on a time shared basis.

Neither the readout and analysis units nor the general area search units impose any significant additions to the current interface requirements for support operations except as required for the planned implementation of the Integrated Information System (IIS). The use of the mensuration units will require additional links with the central computer to provide on-line mensuration data computation.

3.2 Concept #2 - Mechanization with Expanded IIS and Automatic Display Features

The basic approach utilized here is that of mechanizing many routine tasks that consume useful interpreter time. Key components in this concept are the Integrated Control and Display Console (ICDC), representing an extension of the Integrated Information System, and several automated features added to the basic light table display. The ICDC consists of a CRT display and keyboard. Identical units are provided for all interpretation operations. Mensuration units are included as operational equipment. These units are shown in Table 3.

TABLE 3: CONCEPT #2 WORKSTATION UNITS

CLASS OF UNIT	GENERAL MISSION	NUMBER OF * UNITS REQ'D	EQUIPMENT		PERSONNEL REQUIRED*
			TYPE	NUMBER	
Readout, Search, and Analysis	Perform all interpretation operations, including target readout, general area search and detailed analysis for mensuration (Phases I, II, & III).	177	<ul style="list-style-type: none"> o Light Table w/supplementary Optics - Auto Positioning - Auto Coordinate Readout - Auto Annotation and Reader - Change Detection Aids o Integrated Control and Display Console o Microfilm Reader 	177	177
Mensuration	Perform measurements required for target identification and/or simple dimensions associated with immediate readout activities (Phases I & II)	5	<ul style="list-style-type: none"> o Digitized Light Table o Computer Interface 	5	0
TOTAL					177

* Values shown are based on a workload analysis of the expected load from all three systems and assume that a standardized chip system does not exist. See Table 1-1 of the subject report for acquisition system designations. Values include a 19% allowance for leave and training.

Since only one basic image display is provided in this concept it must meet the most stringent quality requirements, i.e., those for detailed examination associated with target readout, detailed analysis and descriptions of new targets. Direct optical viewing is the only display technique capable of meeting these requirements.

The additional display control features that have been included are expected to improve interpreter efficiency by reducing time involved in routine tasks. Although a specific change detection aid has not been identified, several techniques (e.g., flicker, split field comparison) offer potential for improving interpreter efficiency and completeness in identifying significant changes and should be investigated. Other features such as positioning and coordinate readout require the availability of supporting data for effective performance.

The ICDC is incorporated to provide these data as well as to improve interpreter access to all types of collateral data. The ICDC, which is basically a CRT display with a keyboard, will be used to request all collateral material and supporting data but will display only alphanumeric information and perhaps simple graphics. Other data, with the exception of reference imagery, will be provided in a standard microfilm type format and displayed on a microfilm viewer. Quality requirements for viewing reference imagery dictate the use of the light table and supplementary optics for this purpose.

The readout, search, and analysis units, as defined in this concept, impose major requirements for various support operations. The most significant of these include:

- o Central computer links with the ICDC in each unit.
- o Computer storage of complete collateral material indexes with provisions for rapid retrieval.
- o Computer storage of current imagery-related collateral material (ELINT, radar and IR data).

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- On-line capability for all ICDC units to compute geographic coordinates from image coordinate data.
- Links between all ICDC units and central sources of collateral material (imagery, map and reference files) for transmission of collateral requests.
- Processing capabilities to provide and update appropriately formatted materials for the individual microfilm files and readers.
- Capability for annotating assigned imagery to indicate the availability of imagery-related collateral material.

The use of mensuration units will require additional links with the central computer on-line mensuration capability.

3.3 Concept #3 - Mechanization and Search Specialization with Automated Stereo Scanner

The mechanization provided in Concept #2 is incorporated in this concept along with a search specialization capability provided by the automated stereo scanner. Used only for search operations, this component adds the unique capability of stereoscopic viewing during scan. Table 4 describes the classes of workstation units considered in this concept.

The readout and analysis units are identical to those in Concept #2 except that they will not be used for general area search.

The general area search units are unique in the incorporation of the automated stereo scanner. This device provides all of the automated display features used in the readout and analysis units with the exception of the change detection aid. This aid is not considered necessary for general area search. One additional feature, automated scan control, is used to enhance the uniformity and completeness of search area coverage during scan.

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TABLE 4: CONCEPT #3 WORKSTATION UNITS

CLASS OF UNIT	GENERAL MISSION	NUMBER OF* UNITS REQ'D	EQUIPMENT		PERSONNEL REQUIRED*
			TYPE	NUMBER	
Readout and Analysis	Perform all readout operations (Phases I & II) involving known targets (OAK, OAK Supplement and NPIC) and all detailed analysis (Phase III) activities, except mensuration.	143	<ul style="list-style-type: none"> o Light Table w/supplementary Optics <ul style="list-style-type: none"> - Auto Positioning - Auto Coordinate Readout - Auto Annotator and Reader - Change Detection Aids o Integrated Control & Display Console o Microfilm Reader 	143 143 143	143
General Area Search	Perform all general area search operations, i.e., scan all input ground coverage for the presence of new targets; examine new targets found and report significant information (Phase II)	43	<ul style="list-style-type: none"> o Auto Stereo Scanner <ul style="list-style-type: none"> - Auto Positioning - Auto Coordinate Readout - Auto Annotator and Reader - Auto Scan Control o Integrated Control & Display Console o Microfilm Reader 	43 43 43	43
Mensuration	Perform measurements required for target identification and/or simple dimensions associated with immediate readout activities (Phases I & II)	5	<ul style="list-style-type: none"> o Digitized Light Table o Computer Interface 	5 5	0
TOTAL					186

*Values shown are based on a workload analysis of the expected load from all three systems and assume that a standardized chip system does not exist. See Table 1-1 of the subject report for acquisition system designations. Values include a 19% allowance for leave and training.

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The basic display technique incorporated in the automated stereo scanner is direct optical viewing. It is not necessary, therefore, to provide an additional light table for subsequent examination of suspect areas. This advantage is at the expense of the improved viewing comfort provided by the projection techniques.

The ICDC and microfilm reader provide the same capabilities as for the readout and analysis units and are described under Concept #2. The composition and use of the mensuration units are identical with those in Concept #1.

All of the additional support requirements imposed by Concept #2 apply here with the addition of computer support for the preparation of mission parameter tapes and/or other data processing support needed for the automated stereo scanner in each of the general area search units.

4.0 CONCEPT COMPARISON

The size and composition of the three concepts are summarized in Table 5. The individual concepts are compared with respect to several criteria in Table 6. Tables 7 and 8 summarize the effects of the chip system and photointerpreter mensuration options, respectively. The values in all three tables are for equivalent input workloads based on the use of the [] with a 10% improvement, [] Several cautions are in order with respect to the interpretation of these results.

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- They are dependent on a number of assumptions as outlined in the subject report.
- They do not include costs or risks involved in development programs currently funded by NPIC.
- Comparisons are limited to the workstation itself. They do not include many significant factors in the total system such as development and procurement costs for chip system printers, and resources for the development and maintenance of required central computer support capabilities.

TABLE 5: SUMMARY OF CONCEPT WORKSTATION UNITS

CLASS OF UNIT	NUMBER OF UNITS REQUIRED *	EQUIPMENT REQUIRED			
		TYPE	NUMBER *		
			CONCEPT 1	CONCEPT 2	CONCEPT 3
Readout and Analysis (Includes Search for Concept 2)	Concept 1 - 180	Light Table w/Supplementary Optics (Basic)	180	0	0
	Concept 2 - 177	Light Table w/Supplementary Optics (with Auto Features)	0	177	143
	Concept 3 - 143	IIS Display	18	0	0
		ICDC	0	177	143
		Microfilm Reader	0	177	143
General Area Search	Concept 1 - 36	Light Table w/Supplementary Optics (Basic)	36	0	0
	Concept 2 - 0	Rear Projection Viewer	36	0	0
	Concept 3 - 43	Auto Stereo Scanner	0	0	43
		IIS Display	4	0	0
		ICDC	0	0	43
Mensuration	Concept 1 - 6	Microfilm Reader	0	0	43
	Concept 2 - 5	Digitized Light Table	6	5	5
	Concept 3 - 5	Computer Interface	6	5	5

* Values shown are based on a workload analysis of the expected load from all three systems and assume that a standardized chip system does not exist. See Table 1-1 of the subject report for acquisition system designations. Values include a 19% allowance for leave and training.

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TABLE 7 : CHIP SYSTEM EFFECTS

CONCEPTS	WORKSTATION EQUIPMENT PROCUREMENT COSTS	WORKSTATION EQUIPMENT DEVELOPMENT COSTS	WORKSTATION EQUIPMENT DEVELOPMENT RISK	MANPOWER (INTERPRETER) REQUIRED	WORKSTATION FLOORSPACE REQUIRED	OTHER FACTORS
#1 - SEARCH SPECIALIZATION WITH REAR PROJECTION VIEWER		No Signi- ficant Effect	No Signi- ficant Effect	Reduce by 7 Men	Reduce by 634 ft ²	◦ Major effects on image processing, distribution and storage.
#2 - MECHANIZATION WITH EXPANDED IIS AND AUTOMATIC DISPLAY FEATURES		No Signi- ficant Effect	No Signi- ficant Effect	Reduce by 5 Men	Reduce by 742 ft ²	◦ Major effects on image processing, distribution and storage.
#3 - MECHANIZATION AND SEARCH SPECIALIZATION WITH AUTOMATIC STEREO SCANNER		No Signi- ficant Effect	No Signi- ficant Effect	Reduce by 5 Men	Reduce by 742 ft ²	◦ Major effects on image processing, distribution and storage.

NOTE: Implementation of a formal chip system will reduce the number of mensuration units by one in all concepts. The remaining effects are on the readout and analysis units only. There is no effect on general area search units.

TABLE 8: PHOTOINTERPRETER MENSURATION EFFECTS

CONCEPTS	WORKSTATION EQUIPMENT PROCUREMENT COSTS	WORKSTATION EQUIPMENT DEVELOPMENT COSTS	WORKSTATION EQUIPMENT DEVELOPMENT RISK	MANPOWER (INTERPRETER) REQUIRED	WORKSTATION FLOORSPACE REQUIRED	OTHER FACTORS
#1 - SEARCH SPECIALIZATION WITH REAR PROJECTION VIEWER		No Signi- ficant Effect	No Signi- ficant Effect	No Signi- ficant Effect	Increase by 366 ft ²	<ul style="list-style-type: none"> Improved accuracy with some highly specialized targets. May increase the use of mensuration data in readout operations. Requires additional central computer links for on-line computation.
#2 - MECHANIZATION WITH EXPANDED IIS AND AUTOMATIC DISPLAY FEATURES		No Signi- ficant Effect	No Signi- ficant Effect	No Signi- ficant Effect	Increase by 305 ft ²	Same as Concept #1.
#3 - MECHANIZATION AND SEARCH SPECIALIZATION WITH AUTOMATIC STEREO SCANNER		No Signi- ficant Effect	No Signi- ficant Effect	No Signi- ficant Effect	Increase by 305 ft ²	Same as Concept #1.

NOTE: The effects are limited to the mensuration units. Implementation of the mensuration option has no effect on the size and composition of other classes of units.

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None of the three concepts appears clearly superior. The relative importance of such factors as budget, manpower availability, and floor space availability must be established before any selection can be made. The significance of the impact on supporting operations must also be evaluated and included in such a selection.

Some general conclusions about the relative potential of the various approaches are evident in the results obtained:

- A properly designed chip system will have a beneficial effect on workstation performance.
- Search specialization has promise but the development of an effective display for scan is a critical problem.
- Expansion of the Integrated Information System to include the handling of a greater variety of collateral material and additional operations is a recommended approach.
- Incorporation of automated display aids (such as automated positioning and coordinate readout developed in the Automatic Scanner program) should be pursued for all displays.
- Provision of mensuration capability for interpreters should not be done without detailed study of expected frequency of use and performance time effects.

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